CIRCULAR 6175 SEPTEMBER, 1929

DEPARTMENT OF COMMERCE

UNITED STATES BUREAU OF MINES
SCOTT TURNER, DIRECTOR

RECEIVED
OCT 10 1929
U. LIBRARY

INFORMATION CIRCULAR

GEOPHYSICAL ABSTRACTS

NO. V

BY

FREDERICK W. LEE

Digitized by Google

Circular No. 6175.
September, 1929.

INFORMATION CIRCULAR

DEPARTMENT OF COMMERCE - BUREAU OF MINES

GEOPHYSICAL ABSTRACTS [1]

No. 5

Compiled by Frederick W. Lee[2]

TABLE OF CONTENTS

		Page
1.	Gravitational methods	2
2.	Magnetic methods	7
3.	Seismic methods	12
4.	Electrical methods	13
5.	Radioactive methods	17
6.	Geothermal methods	
7.	Unclassified methods	19
8.	Geology	
	Index of authors and subjects	20

LIST OF CONTRIBUTING EDITORS TO GEOPHYSICAL ABSTRACTS

Ayvazoglou, W., U. S. Bureau of Mines, Department of Commerce, Washington, D. C.
Barton, Dr. D. C., Petroleum Building, Houston, Tex.
Eve, Dr. A. S., McGill University, Montreal, Canada.
Foote, Dr. Paul D., Mellon Institute, Pittsburgh, Pa.
Gish, Dr. O. H., Carnegie Institution, Broad Branch Road, Washington, D. C.
Hartley, Kenneth, Humble Oil Co., Houston, Tex.
Hutchinson, Prof. W. Spencer, Massachusetts Institute of Technology, Cambridge, Mass
Jenny, Dr. W. P., 210 McGowen Avenue, Houston, Tex.
Karcher, Dr. J. C., Geophysical Research Corporation, 65 Broadway, New York City.
Keys, Dr. D. A. McGill University, Montreal, Canada.
Knappen, Dr. R. S., Gypsy Oil Co., Tulsa, Okla.
Lane, Prof. Alfred C., Tufts College, Boston, Mass.
Lee, Dr. F. W., Bureau of Mines, Department of Commerce, Washington, D. C.
Leonardon, E. C., 25 Broadway, New York City.
McLaughlin, Prof. Donald H., Harvard University, Cambridge, Mass.
Ostrand, Dr. C. E. Van, Interior Building, Washington, D. C.
Roman, Dr. I., Geophysical Research Corporation, 65 Broadway, New York City.
Ruark, Dr. A. E., Mellon Institute, Pittsburgh, Pa.
Scholl, Louis A., Box 1805, Houston, Tex.
Sundberg, Dr. Karl, Gulf Refining Co., Houston, Tex.
Truemann, O. H. Humble Oil Co., Houston, Tex.
Weaver, Paul, Drawer C., Houston, Texas.
Weelden, Dr. A. von, Shell Petroleum Corporation, Dallas, Tex.
Wright, Dr. F. E., Carnegie Institution, Washington, D. C.
Zuschlag, Dr. Theodor, Swedish American Prospecting Co., 26 Beaver St., N. Y. City.

1. The Bureau of Mines will welcome reprinting of this paper, provided the following footnote acknowledgment is used: "Reprinted from U. S. Bureau of Mines Information Circular No. 6175."
2. Supervising engineer, geophysical section, U. S. Bureau of Mines.

Digitized by Google

1 - GRAVITATIONAL METHODS

DIE TOPOGRAPHISCHE REDUCTION BEI DREHWAGENBEOBACHTUNGEN

(CORRECTIONS OF OBSERVATIONS WITH RESPECT TO TOPOGRAPHY MADE BY MEANS OF A TORSION BALANCE)

By B. Numerov

Zeitschrift fuer Geophysik, Jahrg. 4, 1928, Braunschweig, pp. 117-134.

A numerical proceeding of corrections with respect to topography is worked out for places near the station and a graphical one for the remote part of the terrain. The description is clear and very detailed. The numerical proceeding is very similar to that of the Eötvös and Schweydar methods which are in use already. In both methods the levelling is accomplished in certain circles and fixed azimuths around the station.

While, in using the Eötvös method, the height differences are directly inserted into the final formulas with regard to the foot of the instrument and in case of accurate formulas derived by Schweydar the height differences are calculated with respect to the center of gravity of the attachment, Numerov introduces functions A and B, the heights of the terrain and of the center of gravity, which are to be inserted into the formulas.

The formulas are calculated for the levelling in 8, 16, and 32 azimuths, and the functions A and B for the height of the center of gravity equal to 1 meter; in the Russian text of the article they are given in comprehensive tables ready for use.

In one of the columns the change of the value of the functions with regard to the change in the height of the center of gravity at 1 centimeter is given.

The tables added to the German translation of the article had unfortunately to be shortened greatly, owing to the lack of space. More work must probably be employed here than in using Eötvös' formulas; the amount of work is equal to that necessary in using Schweydar's method. The accuracy is equal to that of Schweydar's method.

The usefulness of the method is proved by a simple example which can be calculated directly also in a different way. For the graphic proceeding the terrain is divided by means of circles and radii into spaces. In all cases

Digitized by Google

when the value of the height is constant the effect of every space on the instrument is the same; therefore the reading only is required. If the value of the height is different the effect of each space must be multiplied by the factor which depends on the height of the terrain and the height of the center of gravity. The representation of these factors is unfortunately not given in a table.

The division of the terrain into spaces is shown in two diagrams.--Translation of K. Jung's abstract.

THE RELATION BETWEEN THE LOCAL ANOMALIES OF THE FORCE OF GRAVITY AND THE DERIVATIVES OF THE POTENTIAL (In Russian)

By B. V. Numerov

Reports of the Academy of Sciences of the U. S. S. R., January, 1929, pp. 101-105.

In this article Numerov derives formulas according to which the potential and its derivatives may be calculated if the distribution of the force of gravity over a certain area is known. Of course, only differences of the derivatives of the potentials of points lying close one to another may be found.

Of practical value are: The first derivatives of the potential of the disturbing mass; the second derivatives or the curvature gradients observed by the aid of the gravitational variometer; and finally, $\frac{\partial^2 V}{\partial z^2}$ which can not be determined by means of the variometer, but the knowledge of the value of which is very important for the interpretation of the gravitational observations.--W. Ayvazoglou.

BEMERKUNGEN ZUR NUMERISCHEN UND GRAPHISCHEN BEHANDLUNG DER KRÜMMUNGSGROSSE

(REMARKS CONCERNING THE NUMERICAL AND GRAPHIC TREATMENT OF THE CURVATURE VALUE)

By K. Jung

Zeitschrift fuer Geophysik, Jahrg. 4, 1928, Braunschweig, pp. 313-317.

The well-known formulas for the calculation of the curvature value from $\frac{\partial^2 u}{\partial x \partial y}$ and $\frac{\partial^2 u}{\partial y^2} - \frac{\partial^2 u}{\partial x^2}$ require in some cases very accurate additional means of calculation if the accuracy of the result shall be equal to that of the data of observation.

Digitized by Google

Here tha author gives a formula which is free from this disadvantage and derives a graphic method for addition, subtraction, and resolution of the components of the curvature values.

Graphical representation of the gradient and the curvature value, as used by Eötvös, is given in a figure. The gradient shows the direction and the amount of the greatest change of the force of gravity by moving in the horizontal direction. The curvature value shows the difference of the two main curvatures of the surface of the level, as well as the direction of the smaller main curvature.

The manner of carrying out the addition, subtraction, and resolution of components is shown in a figure.

The methods explained in the article can often be used in practice to great advantage. If a not too great accuracy is required, a trained draftsman can use the graphic methods in drawing free-hand.

These methods are excellent for use whenever rapidity is more necessary than accuracy, as for example, during all kinds of rough calculations.-- W. Ayvazoglou.

A NEW GRAPHICAL METHOD FOR TORSION-BALANCE TOPOGRAPHIC CORRECTIONS AND INTERPRETATIONS

By C. A. Heiland

Bulletin of the American Association of Petroleum Geologists, vol 13, No. 1, 1929, pp. 39-75.

The graphical methods which have been suggested to date for the computation of topographic corrections and the effects of two--or three--dimensional geologic features involve mostly certain approximations. This makes it in many instances impossible to apply them to very steep topography or to abruptly changing subsurface structures. The approximations and the intricacies of the computations are due to the fact that either orthogonal or cylindrical coordinates are used. The author suggests a new method which is based on the use of spherical coordinates, the final formulas of which are very simple, and which does not involve approximations.

Digitized by Google

For sections made through any sort of terrain or subsurface structure in 16 azimuths, six diagrams are required. The construction of these diagrams is described.

They are applied (1) to the computation of topographic corrections and of corrections for mine openings in underground torsion-balance work; (2) to computations of the influence of two-and-three dimensional subterranean features in torsion-balance interpretation; (3) to computations of the influence of such structures on the magnetometer.--Author's abstract.

INTERPRETATION OF GRAVITATIONAL ANOMALIES

By H. Shaw

The American Institution of Mining and Metallurgical Engineers, Technical Publications No. 178,

The task of interpreting the results of observations obtained by means of the Eötvös torsion balance consists in disentangling the various subsurface anomalies, and subsequently in computing and recombining the effects of these various masses in order to verify the interpretation.

To render the calculations and consequent deduction applicable, certain fundamental assumptions are made and, except in special cases, are retained throughout. After having mentioned these preliminary assumptions and the quantities to be considered, the author divides his work as follows:

Part I. The infinite block:

a. Gradient characteristics: variation of maximum gradient with depth; position of maximum gradient; variation of gradient with distance from face of block; positions at which gradient attains definite values; gradient value at definite distance from edge; gradient interpretation.

b. Characteristics of differential curvature: analysis of differential curvature effects; variation of maximum curvature with depth; position of maximum curvature; variation of differential curvature with distance from face of block; curvature value at definite distance from edge; inclination of curvature curve over edge; differential curvature interpretation.

Digitized by Google

c. Comparison of gradient and curvature effects: ratio of maximum gradient to maximum curvature; intersection of gradient and curvature curves; relation between gradient and curvature values; equations of curves of gradient to curvature ratio; geometrical construction; combined gradient and curvature interpretation.

Part II. Infinite horizontal block with inclined face:

a. Gradient characteristics: value of maximum gradient; position of point of maximum gradient; variation of gradient with distance from edge; positions at which gradient attains definite values; gradient value at definite distance from edge; gradient interpretation.

b. Characteristics of differential curvature: determination of curvature value; maximum curvature values; position of maximum curvature; curvature interpretation.

c. Comparison of gradient and curvature effects: ratio of gradient to curvature; differentiation of gradient and curvature curves; practical example; combined gradient and curvature interpretation.

Part III. Variation of total gravity.

Forty-seven figures illustrate the work.--W. Ayvazoglou.

GRAVITY ANOMALIES AND PETROLEUM EXPLORATION BY THE GRAVITATIONAL PENDULUM

By M. K. Hubbert and Frank A. Melton

Bull. Am. Asso. of Petroleum Geol. vol. 12, No. 9, 1928, pp. 889-899.

The methods of comparing gravity data are discussed with regard to their usefulness for petroleum exploratory work. In flat plains of slight relief one anomaly may be used almost as satisfactorily as any other. However the "free-air" anomaly has the obvious advantage that it involves the least trouble in calculation. But in regions of considerable relief such as mountains and dissected plateaus, the only serviceable anomalies are the topographic and Bouguer anomalies. The latter is a satisfactory practical

Digitized by Google

substitute for the former, which is difficult to compute. All the "isostatic" anomalies are unsatisfactory in rugged topography on account of their assumptions regarding subsurface density conditions, to say nothing of the great difficulty of computation. The free-air anomaly is also unfit for such terranes.--Author's abstract.

2 - MAGNETIC METHODS

UEBER DIE BEI LOKAL VERGLEICHENDEN MAGNETISCHEN MESSUNGEN DER VERTICALINTENSITÄT ANZUSTREBENDE GENAUIGKEIT

(ON THE ACCURACY TO BE STRIVEN FOR IN THE LOCAL COMPARATIVE MEASUREMENTS OF THE VERTICAL INTENSITY)

By J. Koenigsberger

Zeitschrift fuer Geophysik, Jahrg. 4, 1928, pp. 236-245.

In taking earth-magnetic measurements over a fixed subsoil, for example alluvium or gneiss, the measurements made at neighboring places differ a little one from another. This local heterogeneity of the subsoil was established for distances of from 3 to 200 meters; it is almost of the same error, equal to $\pm$ 4 γ, as the error of the results of two measurements taken at the same position in case of two different settings of the instruments.

Therefore, effects of another kind, for example, of the unevenness of the terrain, which are greater than $\pm$ 4 γ on the subsoil rocks examined can be established.--Author's abstract.

ZUR EMPFINDLICHKEITSBESTIMMUNG VON MAGNETISCHEN VARIOMETERN UND ZUR EICHUNG DER MAGNETISCHEN FELDER VON SPULEN

(DETERMINATION OF THE SENSITIVENESS OF MAGNETIC VARIOMETERS AND THE ADJUSTMENT OF THE MAGNETIC FIELDS OF COILS)

By J. Koenigsberger

Zeitschrift fuer Geophysik, Jahrg. 4, 1928, Braunschweig, pp. 151-153.

The author explains a simple proceeding for the adjustment of magnetic variometers by means of a compound coil through which a current flows. The horizontal and vertical intensity of the place in which the adjustment is made must be known to the extent of the percentage to which the graduations of the variometer are to be adjusted. In most cases an accuracy of from 1 to 2 per cent can be considered sufficient.--W. Ayvazoglou.

Digitized by Google

Inf. Cir. No. 6175.

THE KURSK MAGNETIC ANOMALY

COLLECTION OF MAPS OF MAGNETIC ELEMENTS MEASURED UNDER THE GENERAL SUPERVISION OF

P. LASAREFF

Published by Industrial editorship in Leningrad (Promisdat), 1927, Zeitschrift fuer geophysik, Jahrg. 4, 1928, Braunschweig, p. 136.

Twenty-seven maps of nine different places where the Kursk magnetic anomalies are observed, showing the declination, horizontal components, and vertical components of the intensity of the magnetic field, are included in the volume published. The scale of the maps is different, around 1:70000. The maps represent a reproduction of reduced working maps. They include the isomagnetic lines as well as the position of the points observed. (Note: The atlas can be obtained from: Moscow, 3. Muisskaya No. 3).--W. Ayvazoglou.

ERGEBNISSE VON DREHWAGENMESSUNGEN IN SCHESWIG-HOLSTEIN

(RESULTS OF TORSION-BALANCE MEASUREMENTS MADE IN SCHLESWIG HOLSTEIN)

By Karl Jung

Zeitschrift fuer Geophysik, Jahrg. 4, 1928, Braunschweig, pp. 395-400.

This article is an addition to the large work on the magnetic measurements of anomalies in North Germany.

Magnetic measurements in Schleswig-Holstein were already made and published by Dr. H. Reich in his article "Zur Frage der regionalen magnetischen Anomalien Deutschlands, insbesondere derjenigen Norddeutschlands (Ztschr. fuer Geophysik, Jahrg. 4, 1928, pp. 84-102)."

In connection with the latter a trip for gradient measurements with the Eötvös torsion balance was undertaken between Husum and Flensburg. The differences of the force of gravity calculated from the gradients were in general parallel to the anomaly of the magnetic vertical intensity. Based on rough calculations made for the determination of depth, the author supposes that the gradients were influenced by elevated ancient rocks by the pressure of which the magnetically effective main rock had served as an abutment.

Digitized by Google

Gradients of the force of gravity, values of curvatures, and the isanomalies are given in a figure. The depth of the compact masses could not be established with great accuracy because the stations were not close enough to each other and the gradient picture was too much disturbed. Approximate data on the maximum depth could, of course, be established in some places.

The assumptions and the results are given in a table.--W. Ayvazoglou.

MAGNETISCHE ANOMALIEN IM WESTLICHEN MECKLENBURG

(MAGNETIC ANOMALIES IN WEST MECKLENBURG)

By Fr. Schuh

Zeitschrift fuer Geophysik, Jahrg. 4, 1928, Braunschweig, pp. 304-313.

The article is a preliminary report showing a partial result of a larger work which so far is not completed. The object of the future work is to draw a map of magnetic isanomalies of the whole state of Mecklenburg-Schwerin. This map of isanomalies is to serve as a basis for other geophysical and geological investigations.

Schuh describes in this paper the measurements of the vertical intensities made by him in the western part of Mecklenburg-Schwerin during the period from Dec. 27, 1927, to January 19, 1928. The investigations were made by Schmidt's field balance and the corresponding map of isanomalies was drawn. A regional anomaly in the northeastern direction was established.

The amplitude of disturbance reached a value of about 270 δ. Three different kinds of anomalies were established from the measurements made in the western part of Mecklenburg: (1) An anomaly affecting a large area which was connected with more or less great depth of the crystalline subsoil; (2) anomalies caused by great tectonic disturbances which were especially strong when the crystalline subsoil was affected by these tectonic disturbances; and (3) anomalies appearing less strong, caused by the different susceptibilities of the sedimentary subsoil. The author tries to give geological explanation of the causes of the regional, as well as of some local, anomalies.--W. Ayvazoglou.

Digitized by Google

A SIMPLE DERIVATION OF THE WORKING EQUATIONS OF MAGNETIC VARIOMETERS FOR VERTICAL AND HORIZONTAL INTENSITY

By Oliver C. Lester

Bull. Am. Asso. Petr. Geol., vol. 12, No. 8, August, 1928, pp. 855-860.

Derivations of the working equations of a local magnetic variometer in general use in the field are ordinarily based upon complicated theoretical considerations, the use of Lagrange's equations, etc.

These methods call for more theory than is generally at the command of persons using the instrument. The author presents a simple derivation involving nothing more than elementary physics.--Author's abstract.

THE DIP NEEDLE AS A GEOLOGICAL INSTRUMENT

By Noel H. Stearn

The American Institution of Mining and Metallurgical Engineers, Technical Publication No. 151, 1928, 19 pp.

After a detailed description of the principles of the dip needle, its construction, manipulation, and sensitivity, the author derives formulas with the aid of which the variation of the vertical intensity may be calculated from the variations in the inclination of the needle. A variation of 1° of the dip needle was produced by a variation of intensity ranging from 0.25 to 1 per cent, depending on the instrument. The average was slightly less than 0.5 per cent.

The sources of error in the use of the dip needle are divided by the author into three groups:

1. Those introduced by the actual manipulation of the needle,
2. Those introduced by mechanical defects, and
3. Those introduced by certain magnetic factors.

Manipulative sources of error may be caused:

a. By orienting the instrument; the results showed that it is necessary to vary the instrument about 20° from verticality and from 15 to 20° from parallelism with the plane of the magnetic meridian in order to vary the reading by 1°;

b. By taking the readings; the fact that the graduated scale is not in the same plane with the needle gives rise to the possibility of error due to parallax. This can amount to as much as 0.5, but can be minimized by careful readings.

Digitized by Google

Mechanical factors by which errors of much importance may be introduced are enumerated, and a list of tools which are to be carried in the field for the necessary repairs to the dip needle is given.

Magnetic sources of error are diurnal magnetic variation, magnetic storms, and static electrification of the glass face of the instrument.

The dip needle, then, is an instrument designed to measure the relative degrees of distortion in the earth's magnetic field caused by the differential permeability of the formations forming the earth's crust. Its sensitivity is sufficient to detect the variations caused by the ordinary concentrations of ferromagnetic minerals found in the earth's crust, but there exist certain mechanical and theoretical limits to its sensitivity. (Footnote in the article: "The new Hotchkiss Super-dip has overcome these limits, so that it is capable of attaining theoretically infinite sensitivity.")

In conclusion the author gives an example of the results of the investigation accomplished with the dip needle in one of the iron districts of Upper Michigan in which a complicated structural situation exists.

The results of this investigation were later confirmed, thus the applicability of the dip needle as a geological instrument to one type of geological problem proved.--W. Ayvazoglou.

A BACKGROUND FOR THE APPLICATION OF GEOMAGNETICS TO EXPLORATION

By Noel H. Stearn

American Institute Mining and Metallurgical Engineers, Technical Publication No. 150, 1928, 28 pp.

The author describes briefly the phenomenon of terrestrial magnetism and gives a general view on the influence of the geologic and topographic conditions of the earth's crust on the terrestrial magnetic field. After having classified the minerals as diamagnetic, paramagnetic, or ferromagnetic, according to the type and intensity of the reaction which they display, Stearn discusses the effect of these properties of the rocks with regard to their application for exploration. The influence of the neighboring strata having a different capability for being magnetized is examined. The instruments used for the measurement of the magnetic field are mentioned. The author concludes: "An extensive body of empirical data is being built up by the practical application of the geomagnetic method of exploration through the use of various instruments, but since much of this work is still held as confidential, the impossibility of assembling it for a back sight for future guidance is obvious.

Digitized by Google

"Heretofore it has been impossible to predict much regarding the possible results to be expected in new applications of the method. Fortunately the method is sufficiently economical in application that it usually pays to try it out in a problematical case. But some logical basis for a prediction of its applicability has been the grail in quest of which most of those interested in geomagnetics have sent many thoughts. An approach to such a basis of prediction bids fair to lie in tabulating either the specific or relative permeabilities of all common rocks, and work along this line is now actively progressing. Another desirable advantage would be in the devising of a simple apparatus whereby the permeabilities of rock specimens could be obtained quickly. This too, is now receiving attention."--W. Ayvazoglou.

3 - SEISMIC METHODS

A NEW SEISMOMETER EQUIPPED FOR ELECTROMAGNETIC DAMPING AND ELECTROMAGNETIC AND OPTICAL MAGNIFICATION (THEORY, GENERAL DESIGN, AND PRELIMINARY RESULTS)

By Frank Wenner

Bureau of Standards Journal of Research, vol. 2, May, 1929, pp. 963-999.

An elementary discussion is given of the principles involved in the functioning of seismometers equipped for electromagnetic damping and electromagnetic and optical magnification. These principles are then used in the development of an equation giving the relation between angular displacement of the winding of the galvanometer and the linear displacement of the ground. This equation, which is a linear differential equation of the fourth order, contains terms representing the reaction of the galvanometer upon the motion of the steady mass of the seismometer, a point which has previously been neglected and which is of importance unless the seismometer is made much larger than that for which there is any real need. A solution of this equation is given for the case of a sustained harmonic displacement of the ground. Also the corresponding equation and solution are given for the case of tilting of a horizontal-component instrument.

A procedure which may be followed in the development of a general design for a seismometer, to give approximately a specified performance, is illustrated by a concrete example. In this design the steady mass is about 500 grams; the arrangement is such that the period may be determined and the damping adjusted from the recording station, which may be at a distance from the seismometer; and the magnification and its variation with the period of earth displacements, in the range from 2.5 to 60 seconds, is substantially the same as is given by a seismometer of the ordinary type having a magnification for short-period displacements of 1,250, a period of 12.5 seconds, and critical damping.

Digitized by Google

Preliminary results obtained with an experimental seismometer constructed substantially in accordance with this design are given, and a photograph of the instrument is shown.--Author's abstract.

MODERN INSTRUMENTS AND METHODS OF SEISMIC PROSPECTING

By C. A. Heiland

American Institution of Mining and Metallurgical Engineers, Technical Publication No. 149, 1928, 19 pp.

After a brief historical review of the seismic method of prospecting, Heiland gives a description of Schewydar's two-component seismograph and the method of its operation. A résumé of formulas and methods used in the interpretation of seismograms is given. The travel-time curves and their importance are discussed and fundamental formulas of the course of elastic waves in case of vertical, horizontal, or inclined layers are derived. Heiland classifies the interpretation of travel-time curves in three groups:

1. Impulses due to directly arriving and refracted waves;
2. Impulses due to reflected waves;
3. Impulses due to transmission of the tremor through oscillation of the lower layers.

As it is of very great practical importance to know for which geologic problem the formulas using the laws of refraction or the formulas based on the assumption of independent layer-oscillations should be applied, the author is of the opinion that a distinction should be possible by the observation of angles of emergence according to Schweydar's investigation.--W. Ayvazoglou.

4 - ELECTRICAL METHODS

DER GEGENWÄRTIGE STAND DER ELEKTRISCHEN GEOPHYSIKALISCHEN METHODEN

(THE PRESENT STATUS OF ELECTRIC GEOPHYSICAL METHODS)

By W. Heine

Metall und Erz. XXV, vol. 10, 1928, pp. 238-242.

Heine gives a picture of the present status of electric methods of geophysical prospecting drawn from the main publications which have appeared

Digitized by Google

up to this time. The following methods are discussed: 1. Methods of potential lines and potential measurement; 2. electromagnetic methods; 3. methods of phase measurements; 4. methods of current transmission; and 5. electric waves. The possibility of the use of the electric methods for porspecting oil are mentioned.--W. Ayvazoglou.

ZUR THEORIE ELEKTRISCHER BODENFORSCHUNG

(CONCERNING THE THEORY OF ELECTRICAL PROSPECTING)

By W. Heine

Zeitschrift fuer Geophysik, Jahrg. 4, 1928, Braunschweig, pp. 109-112.

Heine calls attention to the errors in formulas calculated with regard to the theory of electrical prospecting by the following authors:

1. R. Ambronn, in his article "Einige Bemerkungen zur Möglichkeit der Aufsuchung und Lokalisierung von schlecht oder nicht leitenden Wechselstrommethoden." (Zeitschrift fuer Geophysik, 3 1927, vol. 2/3).

2. Sundberg, Lundberg, and Eklund, in their article "Electrical Prospecting in Sweden."

3. Debye, in his article "Stationäre und quasistationäre Felder" (Enzyklopädie der mathematschen Wissenschaften, V, 17, p. 415).

4. Gibsone, in his work which appeared in the Zeitschrift fuer Geophysik 3, 1927 vol. 5.

5. The author himself, in his article "Die Einflüsse von Induktion und Kapazität bei geophysikalischen Potentiallinien Messungen mit Wechselstrom" (Physikalische Zeitschrift, 1926, p. 219).--W. Ayvazoglou.

NOTE ON AN ELECTRICAL INVESTIGATION FOR COPPER ORES IN ROUMANIA

By Norbert Gella and H. Bertram Bateman

A paper discussed at a meeting of the Institution of Mining and Metallurgy, London, April, 1929.

The area investigated is situated in eastern Roumania. The copper ores in this field were worked by Germany during the war and further exploitation is now being undertaken by a Roumanian company.

Digitized by Google

The ore is copper pyrites and occurs in varying degrees of concentration in the form of irregular pipes at or near the junction between the two slate formations.

A considerable difference in the electrical conductivity between the ore masses and the surrounding country indicated that the geoelectrical method would be suitable for this investigation.

The problem was to locate the extension of the ore body known already, as well as to locate further ore bodies in the neighborhood, if any such existed.

The results of the electrical indications are given in seven figures showing:

1. The line of junction between the two slate formations;
2. Plan of the first area investigated;
3. Section on main ore body;
4. Section at shaft No 3;
5. Position of electrodes for observation, in plan and section;
6. Current line diagram, electrode position No. 22;
7. Current line diagram, electrode position No. 17.

(Note: Extra copies of this paper may be obtained at a cost of 1 s. 0 d. each, at the offices of the Institution, Cleveland House, 225, City Road, London, E. C. I).--W. Ayvazoglou.

NOTE ON AN ELECTRICAL AND MAGNETIC INVESTIGATION FOR MAGNETITE ORES, NORTH SWEDEN

By Norbert Gella and H. Bertram Bateman

A paper discussed at a meeting of the Institution of Mining and Metallurgy, London, April, 1929.

A survey of the area discussed had already been carried out by the magnetic method of investigation since 1904. As the ore was an excellent electrical conductor in comparison with the country rock, the electromagnetic method was recently employed for the determination of the size of the ore bodies, as well as their extension in depth, in order to establish their commercial value.

Digitized by Google

A general plan of the area is given in a figure. Variations in the magnetic field are shown by means of the lines of equal vertical intensity, and the positions of certain selected profiles are drawn. Curves for vertical intensity, as well as the curve of distortion in the declination and that of the variations in horizontal intensity, are given.

The inductive electrical method was employed:

1. To determine if the ore goes down to a greater depth;
2. To find approximately at what depth it occurs; and
3. To arrive at some approximation as to the width of the lense.

The results of the observations made by the inductive method had shown that the ore was near the surface and that the lenses vary in depth from 30 meters to 100 meters.

Diamond drilling was employed to test the results of the survey. The results demonstrated the conclusions arrived at from the interpretation of the geoelectrical survey; namely, that the ore bodies did not extend in depth and that they narrowed consistently from the surface downward.

(Note: Extra copies of this paper may be obtained at a cost of 1s. 0 d. each, at the offices of the Institution, Cleveland House, 225 City Road, London, E. C. I.)--V. Ayvazoglou.

EIN ELEKTROMAGNETISCHES MESSVERFAHREN ZUR ERFORSCHUNG DES STROMVERLAUFS EINES DEM ERDBODEN MITTELS ZWEIER ELEKTRODEN ZUGEFÜHRTEN WECHSELSTROMES

(AN ELECTROMAGNETIC MEASUREMENT PROCEEDING FOR THE INVESTIGATION OF THE COURSE OF THE CURRENT OF AN ALTERNATING CURRENT CONDUCTED INTO THE GROUND BY MEANS OF TWO ELECTRODES)

By H. Haalck

Zeitschrift fuer Geophysik, Jahrg. 4, 1928, Braunschweig, pp. 405-413.

In employing the electromagnetic methods of prospecting, the fact that the current which passes through the line greatly affects the measurements must be considered very important; thus its influence in the receiving instruments can not be neglected and must either be eliminated or taken

Digitized by Google

into account in calculations. To avoid this influence the author proposes to make the measurements along the profiles parallel to the basis of the electrodes; besides, the intensity of the currents in both branches of the line must be brought, by the aid of adjustable resistances, into such a relation that the influence of the line for a certain profile is balanced. In the article the author explains how with the aid of different arrangements in the line on the terrain the intensity and direction of the magnetic field caused by the earth current only can be measured and calculated.

The measurement proceeding is given in a practical example. The article is illustrated by seven pictures.--W. Ayvazoglou.

5 - RADIOACTIVE METHODS

MÄCHTIGKEITSBESTIMMUNG VON DECKSCHICHTEN UBER SPALTEN DURCH RADIOACTIVITÄTS-MESSUNGEN.

(DETERMINATION OF THE THICKNESS OF THE COVERING LAYERS OVER FISSURES BY MEANS OF RADIOACTIVE MEASUREMENTS)

By J. Koenigsberger

Zeitschrift fuer Geophysik, Jahrg. 4, 1928, Braunschweig, pp. 76-83.

Based on the well-known fact that the ionization of the air by the radiation of radium emanation above tectonic fissures is greater than above other places, it may be concluded that the thickness of the covering layer of different kinds (humus, alluvium, delivium, etc.) can be established from the form of the curve by which the dependency of the ionization on the locality is represented.

A simplified theory for the mathematical solution of the problem is developed; several examples by which the application of the theory is explained are given.--Author's abstract.

DER "RADIO-EMANATOR" UND SEINE ANGEBLICHEN WISSENSCHAFTLICHEN GRUNDLAGEN

(RADIO-EMANATOR AND ITS ALLEGED SCIENTIFIC FOUNDATION)

By H. Hunkel

Metall und Erz. XXV, vol. 9, 1928, pp. 204-206.

In a preliminary remark Hunkel says: "In taking up the disagreeable task of submitting to criticism the radio-emanator, as well as its

Digitized by Google

alleged scientific foundation and work announced in a series of publications, I comply only with the desire of mining circles addressed to me. Questions from the home and foreign countries, as well as the new propaganda publications issued by the "Vertriebsfirma Gewerkschaft Bertha II. Dortmund," show that this criticism answers the urgent public interest."

In the article the author gives a description and a schemetic picture of the radio-emanator constructed by the engineer W. Pastor of Leipzig.

The manner of working of the apparatus is explained and its scientific foundation examined. The result of the examination is summed up by Dr. Hunkel as follows:

"In reality the radio-emanator has absolutely nothing to do with the physical phenomena on which the apparatus is supposed to be based.

"The apparatus may possibly be called a divining-rod only which, owing to its fastening to a vertical axis of rotation can be rotated by the slightest difference in inclination of the axis or by means of slight bendings of the supporting frame."--W. Ayvazoglou.

RADIOACTIVE ATMOSPHERICAL METHOD OF MEASUREMENT FOR GEOPHYSICAL PROSPECTING

By Andrew V. Corry

The American Institution of Mining and Metallurgical Engineers, Technical Publication No. 200,

After a brief introduction in which the author mentions the distribution of radioactive substances in rocks (uranium, thorium), waters and gases in the earth's crust, and refers to the means and units serving for analyzing unknown radioactive substances, he gives a description and a schematic picture of Ambronn's apparatus for measuring emanation content, and examines the method of measuring to be applied for geophysical prospecting.

Cross profiles at right angles to the supposed course of the vein are made by radioactive measurements of their emanation contents in order to detect ores bearing uranium, thorium, and radium-bearing ores. These may be made along a drift, in a shaft, or by floor samples directly under the surface.

Digitized by Google

The mean radium and thorium content of the whole upper strata of the earth is estimated to be 2 by 10 - 12 G. per gram.

Ambronn made excellent sample tests, employing this method in his study of an oil shaft near Celle; at Hamburg other tests were made of a natural gas well; dislocations have been mapped near Blankenberg, an appreciable increase of alpha rays being noted in the emanations of the immediate vicinity. Successful cases of investigation in Russia wherein the method has been used are known also. The Elbof Geophysical Co. of London, employed this method in the location of certain silver-lead lodes, etc. The apparatus used by the Elbof Co. is similar to that described in this article.--W. Ayvazoglou.

7 - UNCLASSIFIED METHODS

DIE PRAKTISCHE ANWENDUNG DER GEOPHYSIKALISCHEN METHODEN IM BERGBAU DES IN- UND AUSLANDES

(PRACTICAL APPLICATION OF GEOPHYSICAL METHODS IN THE MINING INDUSTRY AT HOME AND ABROAD)

By Prof. Dr. Weigelt

Metall und Erz. XXV, vol. 4, 1928, pp. 82-92.

In a lecture delivered at a general meeting of the Association of German Metallurgical and Mining Engineers, Dr. Weigelt discussed the question of practical application of geophysical methods of prospecting at home and abroad. According to his words applied geophysics occupies in the German mining industry, if compared with other countries, a subordinate place only. The participation of German scientists in this work abroad, especially in the United States of America is, of course, very great. The best results are so far obtained in prospecting large archaic shield-shaped masses on the one hand and large basins and plains filled with young sediments on the other.

A predominent position has been reached by the applied geophysics in the last years in the oil industry. The author mentions especially the results obtained in the Gulf-coast plain of Texas and Louisiana in which millions of acres were investigated and oil deposits were discovered. In Europe considerable work has been done in the Vienna basin.

A detailed list of geophysical literature showing the progress of this science is added.--W. Ayvazoglou.

Digitized by Google

BIBLIOGRAPHY

	Page
Bateman, H. Bertram	14-15
Coils, magnetic fields of, adjustment of	7
Copper ores, Roumania, electrical investigation for	14
Corry, Andrew V.	18
Curvature value, numerical and graphic treatment	3
Dip needle, as geological instrument	10
Electrical geophysical methods, present status of	13
Electrical prospecting, theory, errors in formulas calculated with regard to	14
Electromagnetic and optical magnification, new seismometer equipped for	12
Electromagnetic damping, new seismometer equipped for	12
Electromagnetic measurement proceeding, for investigation of the course of an alternating current conducted into the ground by two electrodes	16
Gella, Norbert	14-15
Geomagnetics, application to exploration, background for	11
Geophysical methods, practical application in mining industry	19
Geophysical prospecting, electric methods, present status	13
radioactive atmospherical method of measurement for	18
Graphic method, new, for torsion-balance topographic corrections and interpretations	4
Gravitational anomalies, and petroleum exploration by the gravitational pendulum	6
interpretation of	5
Gravitational pendulum, usefulness for petroleum exploration	6
Gravity, force of, and potential, derivatives of, relation between local anomalies of	3
Haalck, H.	13
Heiland, C. A.	4-13
Heine, W.	13-14
Hubbert, M. K.	6
Hunkel, H.	17
Jung, K.	3-8
Koenigsberger, J.	7-17
Kursk magnetic anomaly, maps of magnetic elements	8
Lasareff, P.	8
Lester, Oliver C.	10
Local anomalies, of force of gravity and derivatives of the potential, relation between	3

Digitized by Google

Page

Magnetic fields of coils, adjustment of 7
Magnetite ores, northern Sweden, electrical and magnetic investigation for 15
Mecklenburg-Schwerin, western, magnetic anomalies in 9
Melton, Frank A. 6

Numerov, B. 2
Numerov, B. V. 3

Petroleum exploration, comparison of gravity anomalies in relation to 6

Radioactive atmospherical method of measurement for geophysical prospecting 18
Radioactive measurements, to determine thickness of covering layers over fissures 17
Radio-emanator, alleged scientific foundation 17
Roumania, electrical investigation for copper ores 14

Schleswig-Holstein, torsion-balance measurements, results 8
Schuh, Fr. 9
Seismic prospecting, modern instruments and methods 13
Seismometer, new, equipped for electromagnetic damping and electromagnetic and optical magnification 12
Shaw, E. 5
Stearn, Noel H. 10-11
Sweden, northern, magnetite ores, electrical and magnetic investigation for 15

Topographical observations, with torsion balance, corrections 2
Torsion-balance corrections and interpretations, new graphic methods for 4
Torsion-balance measurements, Schleswig-Holstein, results 8
Torsion-balance observations, corrections of 2

Variometers, magnetic, sensitiveness, determination of 7
simple derivation of the working equations for vertical and horizontal intensity 10
Vertical intensity, local comparative measurements of, accuracy ... 7

Wenner, Frank 12
Wiegelt, -- 19

Digitized by Google